SPECIFICATION AMENDMENT

1) Insert the following section after the section titled "BACKGROUND OF THE INVENTION" ,but before the section titled "DETAILED DESCRIPTION OF THE EMBODIMENTS":

SUMMARY

A capacitive force sensing device can be built using two parallel plates separated at a certain distance by an elastic spring. As force is applied, the spring may deflect thus reducing the gap between the parallel plates. A reduction in the gap between the capacitor plates can lead to an increase in capacitance. A capacitance meter can detect the change in capacitance occasioned by the decreased distance between the plates. This change in capacitance can be calibrated precisely for various loads applied and can be used to determine the amount of force applied.

When a constant load is placed on an elastic spring, the observed deflection may not be constant, but rather it could decrease and/or increase gradually with time. This behavior is called respectively, relaxation and/or creep. Upon removal of the load, if the spring does not come back to its original position (before the load was placed), the spring can be said to have "set". These properties, including set, are a result of physical (elastic and/or viscoelastic) and chemical (molecular structure) changes in the spring material. The deformation of the spring may be constant over time, else the force calculation may vary and be unpredictable.

In order to avoid relaxation or creep, hysteresis, set, and off-axis loading, a spring assembly may include a helical spring. In other aspects, a spring assembly which may deflect longitudinally in the direction of an applied force, and may deflect transversely to the direction of the applied force such that the transverse deflection does not touch any portion of the upper surface and the lower surface may be possible.

In several other aspects, the spring assembly may be made of metal, and/or the spring assembly may be perforated. The spring assembly may also be slotted, and/or may include one or more conical washers stacked in various arrangements. Conical washers whose inside edge is thicker than their outside edge (e.g., Belleville washers and/or Belleville springs) may also be used in some aspects.

2) Delete paragraphs (003) and (005) from the section titled "BACKGROUND OF THE INVENTION"

3) Please amend paragraph (007) of the section titled "BACKGROUND OF THE INVENTION" as follows:

(a) The marked up version of the amended paragraph (007) is as follows:

Off-axis loading occurs when the direction of the applied load is not along the initial axis of the sensor. Off-axis loading can cause the capacitive plates to become non-parallel and significantly impact the measured capacitance and hence the load. Referring to Fig. 1, Fig. 1<u>a</u>(,) illustrates an example of off-axis loading. Force 110 is applied to platform 120 <u>and the force then may be transmitted to the compression spring 130</u>. Since force 110 is along the initial axis of the sensor, the two capacitor plates 120 and 140 remain parallel. Referring to Fig. 1b, force 150 is applied in a manner, not along the original axis of the sensors 160 and 180<u>, and not along the original axis of the compression spring 170</u>. Consequently, plate 160 rotates to be perpendicular to the direction of force 150 and is no longer parallel to plate 180.

(b) The final, unmarked version of the amended paragraph (007) is as follows:

Off-axis loading occurs when the direction of the applied load is not along the initial axis of the sensor. Off-axis loading can cause the capacitive plates to become non-parallel and significantly impact the measured capacitance and hence the load. Referring to Fig. 1, Fig. 1a(,) illustrates an example of off-axis loading. Force 110 is applied to platform 120 and the force then gets transmitted to the compression spring 130. Since force 110 is along the initial axis of the sensor, the two capacitor plates 120 and 140 remain parallel. Referring to Fig. 1b, force 150 is applied in a manner, not along the original axis of the sensors 160 and 180, and not along the original axis of the compression spring 170. Consequently, plate 160 rotates to be perpendicular to the direction of force 150 and is no longer parallel to plate 180.

4) Please amend paragraph (0011) of the section titled "DETAILED DESCRIPTION OF THE EMBODIMENTS" as follows:

(a) The marked up version of the amended paragraph (0011) is as follows:

When a<u>n</u> unknown load (i.e. force, weight, pressure, etc.) 250 is applied to capacitance plate 225, the spring contracts by a distance Δd<u>, shown as 260 in Fig 2</u>, following the formula:

$$F=k_1\Delta d \qquad \text{EQ. 2}$$

Where $\boldsymbol{F}$ represents the force applied, $\boldsymbol{k_1}$ represents the characteristic of the spring, and $\Delta \boldsymbol{d}$ represents the amount of deflection. Thus by measuring the capacitance before and after unknown load 250 is applied; the force is easily determined.

(b) The final, unmarked version of the amended paragraph (0011) is as follows:

The marked up version of the amended paragraph (0011) is as follows:

When an unknown load (i.e. force, weight, pressure, etc.) 250 is applied to capacitance plate 225, the spring contracts by a distance Δd, shown as 260 in Fig 2, following the formula:

$$F = k_1 \Delta d \qquad \text{EQ. 2}$$

Where $\boldsymbol{F}$ represents the force applied, $\boldsymbol{k_1}$ represents the characteristic of the spring, and $\Delta \boldsymbol{d}$ represents the amount of deflection. Thus by measuring the capacitance before and after unknown load 250 is applied; the force is easily determined.

5) Please amend paragraph (0013) of the section titled "DETAILED DESCRIPTION OF THE EMBODIMENTS" as follows:

(a) The marked up version of the amended paragraph (0013) is as follows:

Referring to Fig. 3, in another embodiment of the invention, the invention utilizes hollow conical metal Belleville spring, also known as a cone washer 340 which deflects both longitudinally 320 (along the axis) and transversely 360 (perpendicular to) the direction of unknown load 305. As shown in Fig. 3, the force sensing invention <u>comprising fixed plate 370 and/or moveable plate 310,</u> is identical, to the force sensing device in Fig. 2, except for cone spring 340. <u>When unknown load 305 is applied to the moveable plate 310, it may deflect to the new position 350.</u> The use of the conical spring provides several substantial advantages. The metal Belleville spring has a large base compared to its height combined with a large flat top surface which makes it unlikely that the placed load will cause the capacitive plates to suffer off-axis loading thus becoming non-parallel. Further, metals tend to be less susceptible to set and creep than other materials.

(b) The final, unmarked version of the amended paragraph (0013) is as follows:

Referring to Fig. 3, in another embodiment of the invention, the invention utilizes hollow conical metal Belleville spring, also known as a cone washer 340 which deflects both longitudinally 320

(along the axis) and transversely 360 (perpendicular to) the direction of unknown load 305. As shown in Fig. 3, the force sensing invention comprising fixed plate 370 and moveable plate 310, is identical, to the force sensing device in Fig. 2, except for cone spring 340. When unknown load 305 is applied to the moveable plate 310, it deflects to the new position 350. The use of the conical spring provides several substantial advantages. The metal Belleville spring has a large base compared to its height combined with a large flat top surface which makes it unlikely that the placed load will cause the capacitive plates to suffer off-axis loading thus becoming non-parallel. Further, metals tend to be less susceptible to set and creep than other materials.

6) Please amend paragraph (0014) of the section titled "DETAILED DESCRIPTION OF THE EMBODIMENTS" as follows:

(a) The marked up version of the amended paragraph (0014) is as follows:

Referring to Fig. 4, the invention replaces the single Belleville spring with a spring whose major characteristics are: the top and bottom surfaces are wide, but not as wide as the middle, that it's deflectable both longitudinally and transversely and the plane of traverse deflection does not connect with (or touch) either of the platforms. As force 405 is placed against capacitive plate 410 it causes longitudinal deflection 415 in spring 430 <u>and/or the capacitive plate 410 may be deflected to the new position 420</u>. However at the points where spring 430 contact capacitive plates 410 and 460, transverse deflection 440 and 450 are negligible which reduces the problem of friction and therefore, hysteresis.

(b) The final, unmarked version of the amended paragraph (0014) is as follows:

Referring to Fig. 4, the invention replaces the single Belleville spring with a spring whose major characteristics are: the top and bottom surfaces are wide, but not as wide as the middle, that it's deflectable both longitudinally and transversely and the plane of traverse deflection does not connect with (or touch) either of the platforms. As force 405 is placed against capacitive plate 410 it causes longitudinal deflection 415 in spring 430 and the capacitive plate 410 is deflected to the new position 420. However at the points where spring 430 contact capacitive plates 410 and 460, transverse deflection 440 and 450 are negligible which reduces the problem of friction and therefore, hysteresis.

7) Please amend paragraph (0017) of the section titled "DETAILED DESCRIPTION OF THE EMBODIMENTS" as follows:

(a) The marked up version of the amended paragraph (0017) is as follows:

Referring to Fig. 5, in lieu of one pair of base to base Belleville spring; more than one such spring can be used. Force 505 is applied to capacitive plate 510 which causes a deflection in both spring 520 and 530. At the point of contact with each other as well as the capacitive plates <u>510 and 560</u>, there is almost no transverse deflection. The transverse deflection occurs only at the pointed ends of springs 520 and 530, and are represented marked 540 and 550 respectively.

(b) The final, unmarked version of the amended paragraph (0017) is as follows:

Referring to Fig. 5, in lieu of one pair of base to base Belleville spring; more than one such spring can be used. Force 505 is applied to capacitive plate 510 which causes a deflection in

both spring 520 and 530. At the point of contact with each other as well as the capacitive plates 510 and 560, there is almost no transverse deflection. The transverse deflection occurs only at the pointed ends of springs 520 and 530, and are represented marked 540 and 550 respectively.